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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/787,406

02/27/2004

Hajime Saiki

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EXAMINER

NORRIS, JEREMY C

ART UNIT

PAPER NUMBER

2841

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
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3 MONTHS

01/29/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No. 10/787,406	Applicant(s) SAIKI ET AL.	
	Examiner Jeremy C. Norris	Art Unit 2841	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 31 October 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 May 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>12/06</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 112

Claims 1-8, 10-12, 14, and 15 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Specifically, all the claims include the limitation "the filling material of the through hole has a coefficient of thermal expansion higher than that of the material constituting the filled vias". However, the specification only discloses situations where the filling material (e.g. epoxy resin) has a CTE *lower* than the material (e.g. copper) of the filled vias. For examination purposes, the Examiner assumes that the claims intend for the CTE of the filling material to be lower than the CTE of the material of the filled vias.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

Art Unit: 2841

2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1, 2, 4-8, 11, 12, 14, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 2002/0145197 A1 (Ohta) in view of US 2002/0175402 A1 (McCormack).

Ohta discloses, referring primarily to figure 1, a wiring substrate, in which a wiring stacked portion including a conductor layer (25) and a resin layer (23, 26) is stacked on a principal face of a core substrate (2) including a substantially cylindrical through hole (13) extending there through and a filling material (15) comprising a resin filling a hollow portion of said through hole, comprising: a cover-shaped conductor portion (16) covering an end face of said through hole just above a principal face of said core substrate and connected to said through hole conductor; and a terminal pad conductor (30) provided over a principal face of said wiring stacked portion for disposing connection terminals (34) used for connections with an external device (38), wherein a

Art Unit: 2841

connection portion composed of via conductors (24, 28) buried in said resin layer brings said cover-shaped connection portion and said terminal pad conductor into conduction, said via conductors are filled vias, said via conductors composing said connection portion are provided not above a center axis of said through hole. Ohta does not specifically disclose that the filling material of the through hole has a coefficient of thermal expansion lower than that of the material constituting the filled vias [claim 1]. However, it is well known in the art to use copper as the material for a via as evidenced by Ohta ([0075]). Therefore, it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to use copper as the via material for the filled via in the invention of Ohta as is known in the art and evidenced by Ohta. The motivation for doing so would have been to ensure a reliable electrical connection. Similarly, it is well known in the art to use epoxy resin as a through hole filling material as evidenced by McCormack ([0033]). Therefore, it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to use epoxy resin as the filling material in the through hole in the invention of Ohta as is known in the art and evidenced by McCormack. The motivation for doing so would have been to use a known dielectric material which is common to the art, thus negating the need for exotic and more expensive materials.

Additionally, the modified invention of Ohta teaches wherein said via conductors are provided not above said filling material in said through hole conductor [claim 2], wherein, of said via conductors, the via conductors to be connected with said terminal pad conductor are provided not above said through hole [claim 4], of said via

Art Unit: 2841

conductors, the via conductors on a side of said terminal pad conductor are more spaced above said through hole from a center axis of said through hole than the via conductors on a side of said cover-shaped conductor portion [claim 5], wherein said connection portion has a stacked via structure, in which a plurality of filled vias (24, 28) are substantially concentrically contiguous to each other at positions other than that above said through hole [claim 6], wherein said through hole is out of position below a center axis of said terminal pad conductor [claim 7], wherein the substantially cylindrical through hole conductor is formed on an inner circumference of the through hole [claim 11], wherein the filled via conductor of the connection portion are made of a metallic material [claim 14].

Similarly, Ohta discloses, a wiring substrate comprising: a core substrate including an insulating substrate (2), a through hole (13) provided through the insulating substrate, a substantially cylindrical through hole conductor (14) formed on an inner circumference of said through hole, and a filling material (15) filling a hollow portion of said through hole conductors; a cover-shaped conductor layer (16) provided on at least one principal face of said core substrate and in a shape containing an end face of said through hole and having conduction to said through hole conductor; a plurality of resin layers (23, 26) provided over said cover-shaped conductor layer; a ball pad conductor (30) provided over said resin layers and having solder balls (34) to be connected with connection terminals of an external device (38); and a connection portion including via conductors (24, 28) buried individually in said resin layers for bringing said cover-shaped conductor layer and said ball pad conductor into conduction, wherein said via

conductors are filled vias, and in case a through direction of said through hole is a center axis direction, an individual center axes of said via conductors composing said connection portion and said ball pad conductor are not aligned with the center axis of said through hole. Ohta does not specifically disclose that the filling material of the through hole has a coefficient of thermal expansion lower than that of the material constituting the filled vias [claim 8]. However, it is well known in the art to use copper as the material for a via as evidenced by Ohta ([0075]). Therefore, it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to use copper as the via material for the filled via in the invention of Ohta as is known in the art and evidenced by Ohta. The motivation for doing so would have been to ensure a reliable electrical connection. Similarly, it is well known in the art to use epoxy resin as a through hole filling material as evidenced by McCormack ([0033]). Therefore, it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to use epoxy resin as the filling material in the through hole in the invention of Ohta as is known in the art and evidenced by McCormack. The motivation for doing so would have been to use a known dielectric material which is common to the art, thus negating the need for exotic and more expensive materials. Additionally, the modified invention of Ohta teaches, wherein said filling material filling a hollow portion of said through hole conductors comprise a resin [claim 12], wherein the filled vias of the connection portion are made of metallic material [claim 15].

Claims 9 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 6,909,054 B2 (Sakamoto) in view of McCormack.

Sakamoto discloses a wiring substrate comprising: a core substrate including an insulating substrate (shown not specifically referenced), a through hole (136) provided through the insulating substrate, a substantially cylindrical through hole conductors formed on an inner circumference of said through hole, and a filling material filling a hollow portion of said through hole conductors; a plurality of resin layers provided over said cover-shaped conductor layer; a ball pad conductor (158) provided over said resin layers and having solder balls (76U) to be connected with connection terminals of an external device (120); and a connection portion including via conductors (60, 160) buried individually in said resin layers for bringing said cover-shaped conductor layer and said ball pad conductor into conduction, wherein the via conductor of said connection portion, which is connected to said through hole is composed of conformal vias (60) whereas the remaining via conductors are composed of filled vias (160), said conformal vias have a hole wall, a metallic material arranged along the hole wall, and a resin material filling the remaining portion of the hole, and in case a through direction of said through hole is a center axis direction, an individual center axes of said via conductor composed of said filled vias and said ball pad conductor are not aligned with the center axis of said through hole. Sakamoto does not specifically disclose a cover-shaped conductor layer provided on at least one principal face of said core substrate and in a shape containing an end face of said through hole and having conduction to said through hole conductor. However, it is well known in the art to provide a cover over through hole in a core substrate as evidenced by McCormack ([0031]). Therefore, it would have been obvious to one of ordinary skill in the art at the time the claimed

Art Unit: 2841

invention was made to provide a cover layer over the through hole in the invention of Sakamoto as is known in the art and evidenced by McCormack. The motivation for doing so would have been to provide structural rigidity to the device by capping the through hole. Additionally, the modified invention of Sakamoto teaches that the filling material filling a hollow portion of said through hole conductors comprises a resin [claim 13].

Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ohta in view of McCormack as applied to claim 1 above, and further in view of US 5,951,917 (Nayak).

Modified Ohta discloses the claimed invention as described above except modified Ohta does not specifically state that the center axes of said via conductors are spaced by $50\mu\text{m}$ or more and $300\mu\text{m}$ or less from a center axis of the through hole [claim 10]. However, such a via pitch is well known in the art as evidenced by Nayak (col. 2, lines 5-10). Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to form the vias in the modified invention of Ohta with a spacing in the above stated range as is known in the art and evidenced by Nayak, The motivation for doing so would have been to increase the wiring density while maintaining required electromechanical integrity. Moreover, it has been held that where the general conditions of a claim are disclosed in the prior art, discovering that optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Response to Arguments

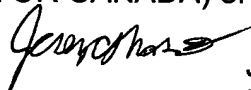
Applicant's arguments with respect to claims 1-15 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jeremy C. Norris whose telephone number is 571-272-1932. The examiner can normally be reached on Monday - Friday, 9:30 am - 5:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dean Reichard can be reached on 571-272-1984. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



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Art Unit 2841